



The genus *Phygasia* Chevrolat (Coleoptera: Chrysomelidae: Galerucinae: Alticini) in Taiwan

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Abstract

The Taiwanese species of *Phygasia* are reviewed. *Phygasia diluta* Chûjô, 1963 is recognized as a valid species and is removed from synonymy with *P. ornata* Baly, 1876. It is a senior subjective synonym of *P. taiwanensis* Ge *et al.*, 2010. The widely distributed *P. ornata* Baly, 1876 is not found on the island of Taiwan but occurs on the Kinmen Island. A new species, *P. chengi*, parapatric with *P. diluta*, is described. A key to the Taiwanese species of *Phygasia* is provided.

Key words: *Phygasia*, new species, new synonym, new species group, Taiwan

Introduction

The genus *Phygasia* Chevrolat, 1836, widespread in Africa and Asia, comprises of about 60 species (Ge *et al.* 2008). This genus can be distinguished from other related genera in Taiwan by a combination of the following characters: length 6.0–8.0 mm; frontal tubercles triangular, entering into interantennal space; pronotum with ante-basal transverse impression limited laterally by short longitudinal impressions; elytra with punctures confused, not arranged in regular rows; pronotum and elytron without pubescence; and procoxal cavities open. *Phygasia ornata* Baly was first recorded from Taiwan by Maulik (1926). A new subspecies, *P. ornata diluta* described by Chûjô (1963), is characterized by its transverse, extremely wide white band on the elytra. Kimoto (1971), who elevated this subspecies to species rank, misidentified some individuals of *P. diluta* as *P. ornata* (Kimoto 1991) possibly because of the extremely variable white band on elytra in both the species. Kimoto and Takizawa (1997) regarded *P. diluta* as a junior subjective synonym of *P. ornata*. Although a new species of *Phygasia* was described recently (Ge *et al.* 2010), taxonomic confusion still prevails.

The Taiwan Chrysomelid Research Team (TCRT) has been initiated to inventory the Chrysomelidae of Taiwan. Extensive collecting revealed that the so-called “*Phygasia ornata*” is a species group characterized by a yellowish-brown head, pronotum, and venter; and the black elytron with a white spot at middle and the orange elytral apex.

Material and Methods

The recent and historical collections at the Taiwan Agricultural Research Institute and the material collected by the TCRT were studied. As most of the old specimens were labeled with the name of collecting sites translated from Japanese, they were again translated into modern names based on Chu and Yamanaka (1973). Two males of *Phygasia ornata* from China, with the following data, were studied for comparison: Fujian, Chunganhshing village, Tungmukuan, 800–900 m, 30.VII.1960, leg. Sheng-Qiao Jiang.

For the preparation of genitalia drawings, the abdomen was separated and boiled in 10% KOH solution, followed by washing in distilled water. Genitalia was then mounted on slides in glycerin and studied and drawn using a Leica M165 stereomicroscope. For detailed examination a Nikon ECLIPSE 50i microscope was used. At least three dissections were made for each sex of all the three species to detect inter- and intraspecific variation of male and female genitalia.

Specimens, including types, are deposited in the following collections: HNHM: Hungarian Natural History Museum, Budapest, Hungary; NMNS: National Museum of Natural Science, Taichung, Taiwan; TARI: Taiwan Agricultural Research Institute, Wufeng, Taiwan. Host plant associations were confirmed by laboratory rearing.

Phygasia ornata species group

Diagnosis. Color (Figs 1–6) yellowish-brown, elytra black with a transverse white band at middle, and orange apex. Male antenna with antennomeres III–VII widened (Figs 7–13). Penis (Figs 14–16) in dorsal view parallel-sided, strongly narrowed subapically, apex rounded; moderately curved in lateral view. Spermatheca (Figs 20–22) with receptacle swollen; pump curved; proximal spermathecal duct wide. Sternite VIII (Figs 23–25) weakly sclerotized at apex, with several short setae along apical border. Spiculum slender. Gonocoxa (Figs 17–19) weakly sclerotized basally, apex widely rounded, with three to five long setae at outer side, two or three long setae at apex. Bursa sclerites present in *P. diluta* and *P. ornata*. *Phygasia ornata* with one pair of bursa-sclerites, each with single seta. Number and size of bursa-sclerites vary greatly in *P. diluta*. Some individuals with only one pair of bursa-sclerites bearing single seta; others with two pairs of bursa sclerites, dorsal pair (Figs 27a, 28a) better developed, with three or four prominent setae, base well-developed; ventral pair (Figs 27b, 28b) with one to three prominent setae but base weakly-sclerotized.

Note. Members of *Phygasia ornata* species group can be distinguished by the color pattern: yellowish-brown head, pronotum, and venter; and the black elytron with a white spot at middle, and the orange elytral apex. No other species group has so far been recognized in *Phygasia*.

Although female genitalic structures are very similar in members of this species group, most of them, except gonocoxa, are diagnostic. Gonocoxa (Figs 17–19) is not diagnostic as the number of setae on apex and outer side are highly variable.

Phygasia chengi Lee, new species

(Figs 1–3, 7–9, 14, 17, 20, 23, 26)

Phygasia ornata: Maulik, 1926: 413 (misidentification); Chûjô, 1936: 18 (part); Kimoto, 1971: 78; Kimoto, 1987: 192; Kimoto, 1989: 269; Kimoto, 1991: 24 (part); Kimoto & Chu, 1996: 121 (catalog); Lee & Cheng, 2007: 143 (catalog).

Phygasia ornata diluta: Kimoto, 1966: 35 (part).

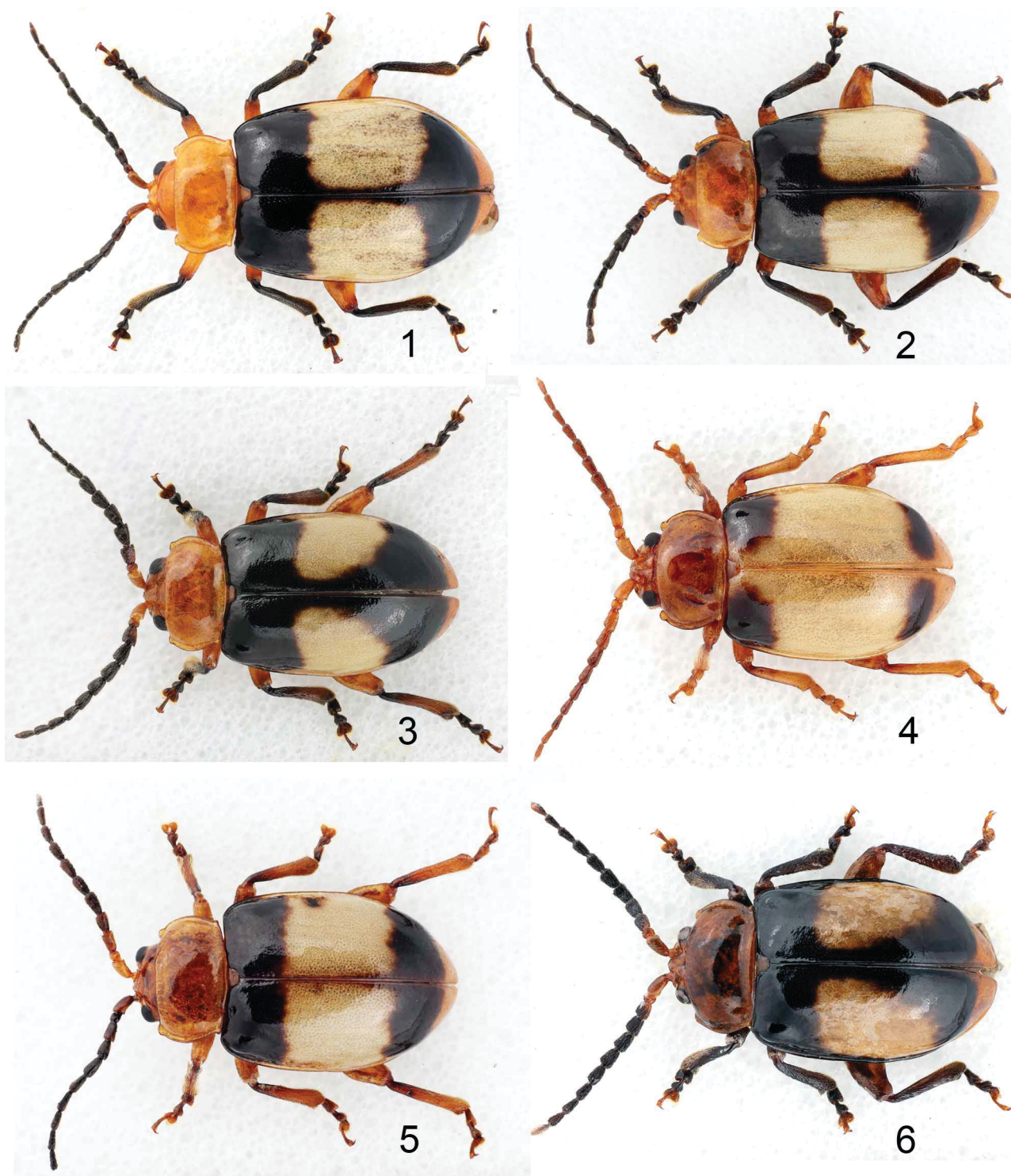
Description. Male. Length 7.3–7.9 mm, width 3.7–4.2 mm. General color yellowish-brown; antennomeres III–XI, tibia, tarsus black; elytron black, with one big transverse white band at middle, almost connected with each other at suture (Fig. 1), apex orange. Pronotum about 1.9 times wider than long, disc smooth, with scattered fine punctures. Elytra 1.4 times longer than wide, lateral margin slightly rounded, widest just behind middle, disc with densely distributed small punctures and randomly occurring large punctures.

Antenna (Fig. 7) with antennomeres III–VII widened; ratio of length of antennomeres III to XI about 1.0 : 1.2 : 1.3 : 1.2 : 1.2 : 1.1 : 1.1 : 1.1 : 1.4, ratio of length to width of antennomeres III to XI about 1.4 : 1.7 : 1.9 : 1.8 : 2.0 : 2.3 : 2.8 : 3.1 : 4.8. Penis (Figs 14a, b) wide, about 3.9 times longer than wide, apex of tectum a little lower than that of penis, subparallel-sided, strongly narrowed subapically, apex rounded, moderately curved in lateral view; ventral side evenly convex.

Female. Length 6.8–8.1 mm, width 3.5–4.3 mm. Antennomeres III–VI narrower (Fig. 9), ratio of length of antennomeres III to XI about 1.0 : 1.1 : 1.2 : 1.1 : 1.1 : 1.1 : 1.0 : 1.0 : 1.3, ratio of length to width of antennomeres III to XI about 1.9 : 2.2 : 2.4 : 2.2 : 2.4 : 2.5 : 2.5 : 3.1 : 4.9. Gonocoxa (Fig. 17) medially connected, apex widely rounded, base weakly sclerotized, two long setae at tip, three or four long setae at outer side. Spiculum of sternite VIII (Fig. 23) relatively shorter than *P. ornata* and *P. diluta*. Spermatheca (Fig. 20) with receptacle strongly swollen; pump strongly curved, apex rounded; proximal spermathecal duct wide. Bursa-sclerites absent.

Variation. Some individuals in high mountains have smaller white spots on the elytra (Figs 2–3) and wider antenna (Fig. 8) in males (ratio of length to width of antennomeres III to XI about 1.2 : 1.4 : 1.6 : 1.6 : 1.8 : 1.9 : 2.1 : 2.1 : 3.3).

Diagnosis. See diagnosis of *Phygasia ornata*.



FIGURES 1–6. Color habitus of *Phygasia* species, dorsal. 1–3. *P. chengi*; 4–5. *P. diluta* ; 6. *P. ornata*.

Types (117 specimens). Holotype ♂: Hsinchu, Wuchihshan, 14.V.2008, leg. S.-F. Yu (TARI). Paratypes: 3♂♂, 5♀♀, same as holotype (TARI); 1♂, 1♀, Shinchiku (= Hsinchu city), 1–30.VII.1918, leg. J. Sonan (TARI); 1♀, Hsinchu, Lupi, 20.VII.2008, leg. M.-H. Tsou (TARI); 1♀, Hsinchu, Seto (= Wufeng), 21.VII.1935, leg. M. Chujo (TARI); 1♀, same locality, 14–16.VII.1982, leg. K. C. Chou & C. C. Pan (TARI); 2♂♂, 2♀♀, same locality, 15.V.2008, leg. H. Lee (TARI); 1♀, Ilan, Chinyang, 23.X.2011, leg. S.-I. Tsai (TARI); 1♂, Ilan, Shikigun (= Ssuchi), 22.V.1931, leg. R. Takahashi (TARI); 2♂♂, same locality, 1.VIII.2009, leg. M.-H. Tsou (TARI); 1♀, Ilan,

Ssuyuanyakou, 30.VI.2008, leg. M.-H. Tsou (TARI); 1♀, Ilan, Taiheizan (= Taipingshan), VI.1930, leg. S. Minowa (TARI); 1♀, same locality, V.1935, leg. Y. Miwa (TARI); 1♀, same locality, 10.VII.1940, leg. R. Matsuda (TARI); 1♀, same locality, 10.V.1942, leg. R. Tanaka (TARI); 1♂, 1♀, Ilan, Tsuifenghu, 15.VIII.2007, Y.-C. Chang (TARI); 2♂♂, 1♀, Miaoli, Hohsinglinchang, 1.V.2008, leg. H. Lee (TARI); 1♀, Nantou, Huakang, 13.IX.2010, leg. C.-F. Lee (TARI); 2♀♀, Nantou, Lushan, 27–32.V.1980, leg. K. S. Lin & L. Y. Chou (TARI); 2♂♂, 2♀♀, Nantou, Meifeng, 17.VI.2010, leg. C.-F. Lee (TARI); 1♂, same locality, 17–22.VI.1979 (TARI); 2♂♂, 1♀, same locality, 8.VI.1980, leg. K. S. Lin & B. H. Chen (TARI); 1♂, same locality, 26.VIII.1980, leg. K. S. Lin & C. H. Wang (TARI); 1♀, same locality, 24–26.VI.1981, leg. K. S. Lin & W. S. Tang (TARI); 1♀, same locality, 28–29.VIII.1981, leg. L. Y. Chou & S. C. Lin (TARI); 1♂, same locality, 31.VIII–2.IX.1982, leg. L. Y. Chou & K. C. Chou (TARI); 1♂, Nantou, Baibara (= Meiyuan), 4–7.VII.1939, leg. Y. Miwa (TARI); 1♂, Nantou, Nanshanchi, 8.VI.1965, leg. B.-S. Chang (NMNS); 1♂, Nantou, Puli, 16–19.V.1956, leg. K. S. Lin (TARI); 1♂, 1♀, Nantou, Tattaka (= Sungkang), 24.V.1927, leg. K. Fukuda (TARI); 2♂♂, Nantou, Tsuifeng, 27.VIII.1981, leg. L. Y. Chou & S. C. Lin (TARI); 1♂, Nantou, Tungpu, 25–29.IX.1980, leg. L. Y. Chou & T. Lin (TARI); 1♂, same locality, 28.IV–2.V.1981, leg. T. Lin & C. J. Lee (TARI); 1♀, same locality, 5–8.X.1981, leg. T. Lin & W. S. Tang (TARI); 1♀, same locality, 20–24.VI.1983, leg. K. C. Chou & C. Y. Wong (TARI); 1♂, Nantou, Wanfengtsun, 10.VII.2007, leg. M.-H. Tsou (TARI); 1♂, 2♀♀, same locality, 13.IV.2010, leg. W.-T. Liu (TARI); 2♀♀, Nantou, Musha (= Wushe), 18.V–15.VI.1919, leg. T. Okuni (TARI); 1♂, same locality, 22.V.1927, leg. K. Fukuda (TARI); 1♀, same locality, 25.VI–5.VII.1947, leg. Maa, Chen, & Liu (TARI); 1♂, same locality, 23–28.VI.1981, leg. K. S. Lin & W. S. Tang (TARI); 2♂♂, same locality, 26–28.VIII.1981, leg. L. Y. Chou & S. C. Lin (TARI); 1♂, 1♀, same locality, 14.VII.1982, leg. S. C. Lin & C. N. Lin (TARI); 1♂, same locality, 30.VIII–2.IX.1982, leg. L. Y. Chou & K. C. Chou (TARI); 1♂, same locality, 7–8.X.1982, leg. K. C. Chou (TARI); 1♂, Taichung, Chiapaotai, 14–18.X.1980, leg. K. S. Lin & C. H. Wang (TARI); 1♀, Taichung, Lishan, 26.VI.1979, leg. K. S. Lin & L. Y. Chou (TARI); 1♂, Taichung, Tachien, 2.IX.1987, leg. I.-C. Hsu (NMNS); 1♀, Taichung, Wuling, 21.VI.1979, leg. K. S. Lin & B. H. Chen (TARI); 3♀♀, same locality, 27–29.VI.1979, leg. K. S. Lin & L. Y. Chou (TARI); 3♂♂, 5♀♀, same locality, 30.VI.2008, leg. M.-H. Tsou (TARI); 1♂, same but with “leg. S.-F. Yu” (TARI); 3♂♂, 1♀, Taichung, Wushihkeng, 13.VII.2008, leg. C.-F. Lee (TARI); 1♀, same but with “leg. M.-H. Tsou” (TARI); 1♂, 2♀♀, Tainan, Kuangtyling, 30.IX.1955, leg. S. C. Chiu (TARI); 1♂, 1♀, Taihoku (= Taipei, City), IX.1911, leg. I. Nitobe (TARI); 1♀, same locality, 2.IV.1933, leg. M. Chujo (TARI); 1♂, same locality, 25.V.1933, leg. Y. Miwa (TARI); 1♀, same locality, X.1935 (TARI); 1♂, Taipei, Hsikenglinao, 3.VII.2010, Y.-L. Lin (TARI); 1♂, 1♀, Taipei, Pinglin, 6.V.2007, leg. S.-F. Yu (TARI); 1♀, Taipei, Ssushoushan, 4.VII.2004, leg. H.-T. Cheng (TARI); 1♂, Taipei, Urai (= Wulai), 20.IV.1930, leg. M. Chujo (TARI); 2♂♂, 1♀, same locality, 24.VI.1933, leg. K. Kobayashi (TARI); 1♀, same locality, 25.V.2007, leg. H.-J. Chen (TARI); 2♂♂, 2♀♀, Taitung, Motien, 5.X.2010, leg. C.-F. Lee (TARI); 1♂, Taoyuan, Paling, 18.VII.1980, leg. B.-S. Chang (NMNS); 1♂, Taoyuan, Ssuleng, 30.VIII.2008, leg. M.-H. Tsou (TARI).

Etymology. This new species is named after Mr. Hsing-Tzung Cheng of TCRT, who collected the first specimens.

Host plants. Asclepiadaceae: *Dregea volubilis* (L. f.) Benth., *Heterostemma brownii* Hayata, *Marsdenia formosana* Masam., *M. tinctoria* R. Brown, *Cynanchum boudieri* H. Lev. & Vaniot.

Distribution. North Taiwan (Fig. 26). In south of Kuantyling (Tainan county), it is sympatric with *Phygasia diluta*. It is widespread from lowlands to high mountains of about 2500 m.

Phygasia diluta Chûjô, 1963, status resurrected

(Figs 4, 5, 10, 11, 15, 18, 21, 24, 26–32)

Phygasia ornata: Chûjô, 1936: 18 (part); Kimoto, 1991: 24 (part).

Phygasia ornata diluta Chûjô, 1963: 400; Kimoto, 1966: 35 (part); Kimoto and Takizawa, 1997: 411 (synonymized with *P. ornata*).

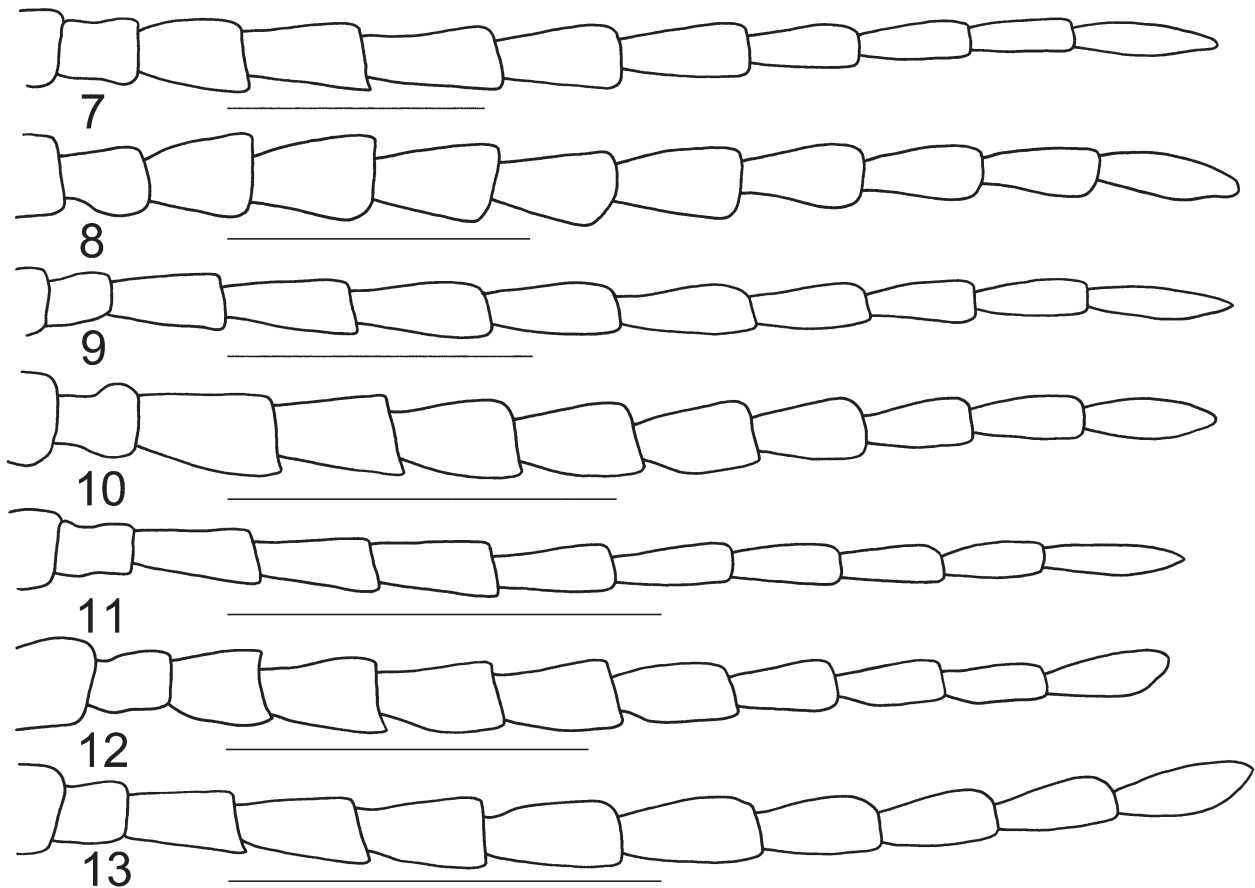
Phygasia diluta: Kimoto, 1971: 78 (raised to species rank).

Phygasia taiwanensis Ge *et al.*, 2010: 325. **New synonym**

Description. Male. Length 5.8–6.4 mm, width 3.1–3.5 mm. General color (Fig. 4) yellowish-brown; antennomeres III–XI darkened, tibia basally darkened; elytron white; one transverse black spot at humerus and subapically, apex orange, with narrow transverse black band between white and orange areas. Pronotum about 1.8 times wider than

long, disc smooth, with scattered fine punctures. Elytra 1.4 times longer than wide, lateral margin slightly rounded, widest just behind middle, disc with densely distributed small punctures and randomly occurring large punctures.

Antennomeres III-VII widened (Fig. 10); ratio of length of antennomeres III to XI about 1.0 : 0.8 : 0.9 : 0.9 : 0.9 : 0.8 : 0.8 : 1.0, ratio of length to width of antennomeres III to XI about 1.7 : 1.4 : 1.5 : 1.6 : 1.8 : 1.8 : 2.1 : 2.5 : 3.2. Penis (Figs 15a, b) elongate, about 4.3X longer than wide, apex of tectum a little lower than that of penis, subparallel-sided, strongly narrowed subapically, apex rounded, moderately curved in lateral view; ventral side evenly convex.



FIGURES 7–13. Antenna. 7. *P. chengi*, male; 8. *P. chengi*, male; 9. *P. chengi*, female; 10. *P. diluta*, male; 11. *P. diluta*, female; 12. *Phygasia ornata*, male; 13. *P. ornata*, female. Scale = 1.0 mm.

Female. Length 5.3–7.0 mm, width 3.0–4.0 mm. Similar to males, but antennomeres III-VIII narrower (Fig. 11), ratio of length of antennomeres III to XI about 1.0 : 1.0 : 1.1 : 1.0 : 1.0 : 1.0 : 0.8 : 0.8 : 1.2, ratio of length to width of antennomeres III to XI about 2.1 : 2.0 : 2.2 : 2.2 : 2.3 : 2.6 : 2.4 : 2.6 : 4.0. Gonocoxa (Fig. 18) medially connected, apex widely rounded, base weakly sclerotized, three long setae at apex, three long setae at outer side. Spermatheca (Fig. 21) with receptacle strongly swollen; pump strongly curved, apex rounded; proximal spermathecal duct wide. Spiculum of sternite VIII (Fig. 24) longer than *P. chengi* but shorter than *P. ornata*. Bursa-sclerites highly variable. Some individuals with only one pair of bursa-sclerites, each with single seta; others with two pairs of bursa sclerites, dorsal pair (Figs 27a, 28a) better developed, with three or four prominent setae, base well-sclerotized; ventral pair (Figs 27b, 28b) with one to three prominent setae but base weakly-sclerotized.

Color variation. In some specimens, the transverse black spots on humerus and near elytral apex form transverse bands across elytral base and apex and the antennomeres III-XI, tibia, and tarsus are almost black (Fig. 5).

Diagnosis. *Phygasia diluta* differs from *P. ornata* and *P. chengi* by its yellow-brown or dark brown antenna, tibia, and tarsus (antenna, tibia, and tarsus black in *P. ornata* and *P. chengi*); relatively wider penis (4.3 times longer than wide) compared to *P. ornata* (4.6 times longer than wide) and narrower penis compared to *P. chengi* (3.9 times longer than wide); relatively longer sternite VIII compared to *P. chengi* and shorter sternite VIII compared to *P. ornata*.

Type material examined. Holotype ♂ (Fig. 29) of *Phygasia ornata diluta* Chûjô labeled (Fig. 30): “Formosa Sauter / Takao (= Kaoshiung city) 1907.VIII.1 / Holotypus *Phygasia ornata* ssp. *diluta* Chujo / Holotype / *Phygasia ornata diluta* CHUJO Det. M. CHUJO, 1961” (HNHM). Allotype ♀ (Fig. 31) labeled (Fig. 32): “Formosa Sauter / Kanshirei (= Kuangtyling, Tainan county) 908.VI.7-(19)15. / Allotypus *Phygasia ornata* ssp. *diluta* Chujo / Allotype / *Phygasia ornata diluta* CHUJO Det. M. CHUJO, 1961” (HNHM).

Material examined (27 specimens). 1♀, Pingtung, Kankau (= Changkou), 27.V.1932, leg. R. Takahashi (TARI); 1♀, Pingtung, Kuaru (= Kenting), 15.VI.1937, leg. M. Chujo (TARI); 1♀, same locality, 18–23.III.1981, leg. K. S. Lin & T. Lin (TARI); 1♂, same locality, 22–26.III.1982, leg. T. Lin & S. C. Lin (TARI); 1♀, same locality, 24.XI.2009, leg. C.-F. Lee (TARI); 4♂♂, 4♀♀, Pingtung, Sheting, 15.VIII.2009, leg. S.-F. Yu (TARI); 2♂♂, 5♀♀, same but with “leg. M.-H. Tsou” (TARI); 2♂♂, 2♀♀, Pingtung, Shuangliu, 19.VII.2007, leg. S.-F. Yu (TARI); 1♂, same locality, 30.V.1997, leg. C. W. & L. B. O’Brien (NMNS); 1♀, Pingtung, Tahanlintao, 22.VIII.2011, leg. J.-C. Chen (TARI); 1♂, Taitung, 4km N. Chinglun, 30.V.1997, leg. C. W. & L. B. O’Brien (NMNS).

Host plant. Asclepiadaceae: *Gymnema sylvestre* (Retz.) Schultes.

Distribution. Southern Taiwan (Fig. 26). This species is restricted to lowlands.

Phygasia ornata Baly, 1876

(Figs 6, 12, 13, 16, 19, 22, 25, 26)

Phygasia ornata Baly, 1876: 445 (Hong Kong); Maulik, 1926: 413 (India); Chen, 1933a: 43 (China: Guandong); Chen, 1933b: 221 (China: Jiangxi, Guizhou); Gressitt & Kimoto, 1963: 885 (China: Fujian); Wang, 1995: 266 (China: Zhejiang); Yu *et al.*, 1996: (China: Hubei, Hunan, Sichuan, Guanxi, Hainan, and Yunnan); Mohamedsaid, 1998: 93 (Malaysia); Kimoto, 2000: 268 (Thailand); Medvedev, 2007: 635 (Vietnam); Ge *et al.*, 2008: 555 (China: Henan and Anhui).

Lactica bipustulata Jacoby, 1892: 919 (Burma). Synonymized by Scherer (1969)

Description. Male. Length 6.0–6.3 mm, width 3.3–3.6 mm. General color (Fig. 6) yellowish-brown; antennomeres III–XI, tibia, tarsus black; elytron black, with one big transverse white band at middle, anterior border horizontal, posterior border oblique, apex orange. Pronotum about 1.9 wider than long, disc finely wrinkled, with scattered fine punctures. Elytra 1.4 times longer than wide, lateral margin slightly rounded, widest just behind middle, disc with densely distributed small punctures and randomly occurring large punctures.

Antenna (Fig. 12) with antennomeres III–VII widened; ratio of length of antennomeres III to XI about 1.0 : 1.3 : 1.4 : 1.2 : 1.4 : 1.1 : 1.2 : 1.1 : 1.4, ratio of length to width of antennomeres III to XI about 1.3 : 1.6 : 1.7 : 1.5 : 1.9 : 2.0 : 2.3 : 2.3 : 2.9. Penis (Figs 16a, b) elongate, about 4.6 times longer than wide, apex of tectum much lower than that of penis, subparallel-sided, strongly narrowed subapically, evenly convex ventrally, apex rounded, moderately curved in lateral view.

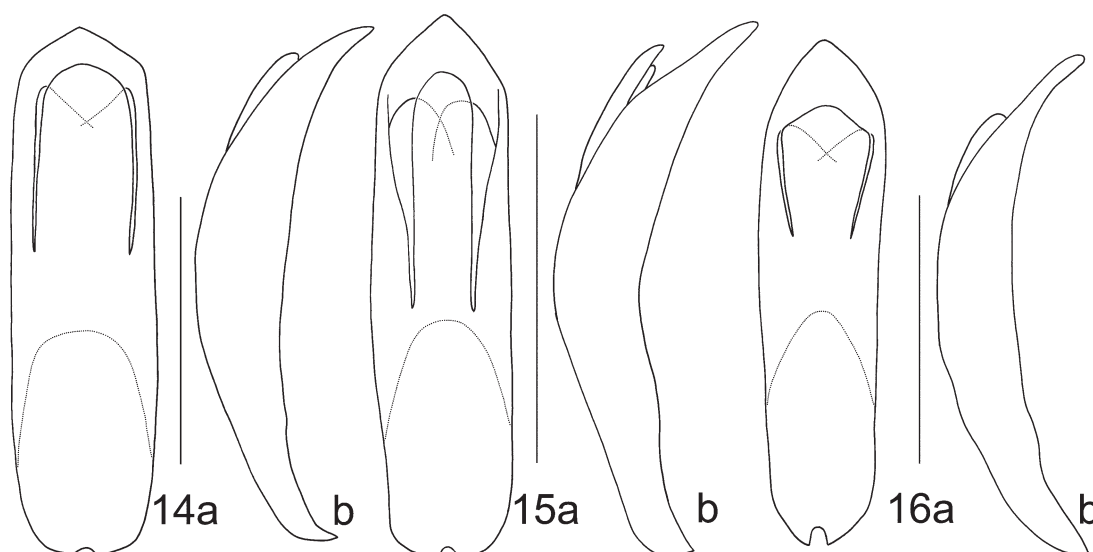
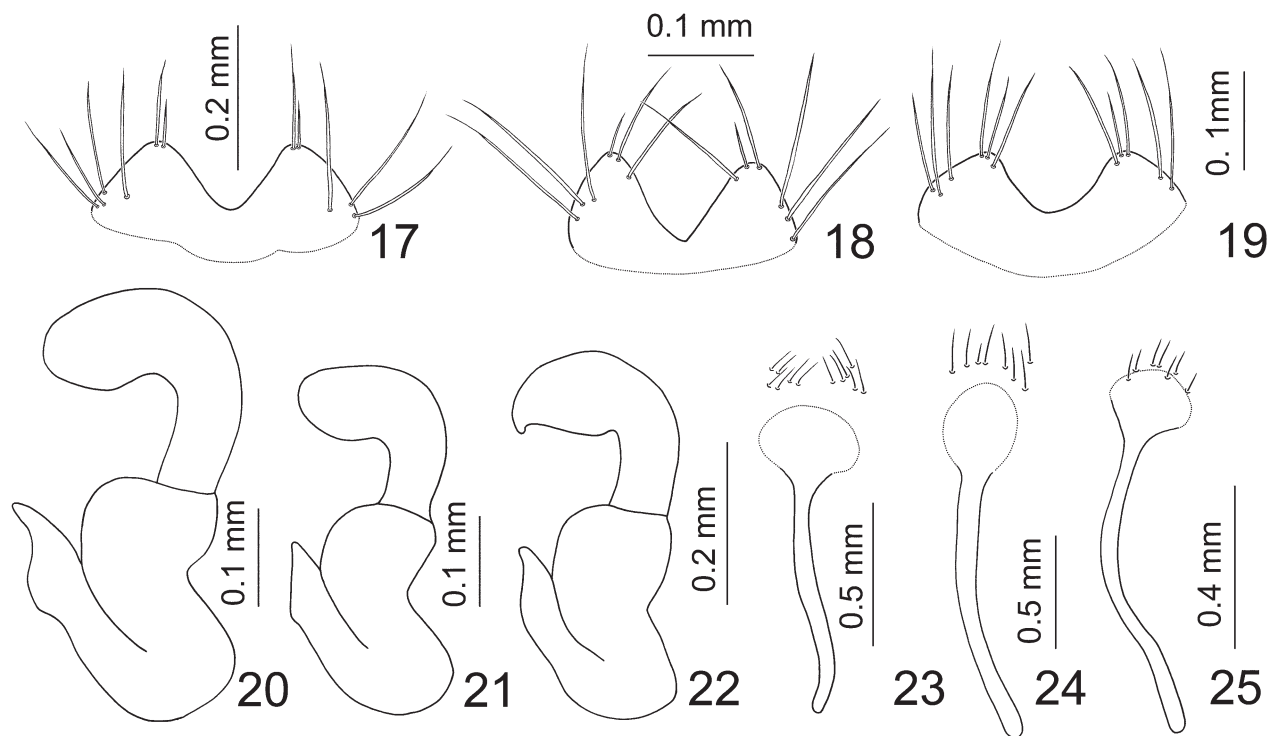


FIGURE 14–16. Male genitalia. 14. *P. chengi*, a: dorsal, b: lateral; 15. *P. diluta*, a: dorsal, b: latera; 16. *Phygasia ornata*, a: dorsal, b: lateral; l. Scale = 1.0 mm.

Female. Length 6.0–6.2 mm, width 3.3–3.5 mm. Antennomeres III–VI narrower (Fig. 13), ratio of length of antennomeres III to XI about 1.0 : 1.1 : 1.1 : 1.1 : 1.1 : 1.1 : 1.0 : 1.0 : 1.1, ratio of length to width of antennomeres III to XI about 1.9 : 1.9 : 1.8 : 1.9 : 2.1 : 2.1 : 2.1 : 2.3 : 2.8. Gonocoxae (Fig. 19) medially connected, apex widely rounded, base weakly sclerotized, three long setae at apex, two or three long setae at outer side. Spermatheca (Fig. 22) with receptacle strongly swollen; pump strongly curved, apex pointed; proximal spermathecal duct wide. Spiculum of sternite VIII (Fig. 25) rather slender. Only one pair of bursa-sclerites present, each with single seta.



FIGURES 17–25. Female genitalia. 17. *P. chengi*, gonocoxae; 18. *P. diluta*, gonocoxae; 19. *Phygasia ornata*, gonocoxae; 20. *P. chengi*, spermatheca; 21. *P. diluta*, spermatheca; 22. *P. ornata*, spermatheca; 23. *P. chengi*, sternite VIII; 24. *P. diluta*, sternite VIII; 25. *P. ornata*, sternite VIII.

Diagnosis. *Phygasia ornata* is similar to *P. chengi* with its black antenna, tibia, and tarsus, but differing with the slender penis (aedeagus is about 4.6 times longer than wide in *P. ornata*, while the same is about 3.5 times longer than wide in *P. chengi*), pointed apex of spermathecal pump (apex of spermathecal pump rounded in *P. chengi* and *P. diluta*), and relatively longer spiculum of sternite VIII (shorter spiculum of sternite VIII in *P. chengi* and *P. diluta*), and the consistent color pattern (median white band on the elytra in *P. chengi* and *P. diluta* is variable).

Material examined (12 specimens). 1♂, 1♀, Chinmen, 30.IV.2008, leg. W.-T. Liu (TARI); 3♂♂, 1♀, Chinmen, Maoshanta, 12.V.2011, leg. Y.-J. Chang (TARI); 3♂♂, 3♀♀, Chinmen, Chungshanlin, 17–19.V.2008, leg. C.-S. Tung (TARI).

Host plant. Asclepiadaceae: *Gymnema sylvestre* (Retz.) Schultes.

Distribution. China (Anhui, Fujian, Guandong, Guanxi, Guizhou, Hainan, Henan, Hong Kong, Hubei, Hunan, Jiangxi, Sichuan, Yunnan), India, Malaysia, Myanmar, Thailand, Taiwan (Kinmen island, **new record**), Vietnam. In Taiwan, this species is found only on Kinmen island (= Chinmen) (Fig. 26). Ten other species of Chrysomelidae were recorded from Kinmen island by Shih et al. (2002).

Key to the species of *Phygasia* in Taiwan

- 1 Penis longer (Fig. 16) (4.6 times longer than wide), pronotum finely wrinkled; apex of pump of spermatheca pointed (Fig. 22) *P. ornata* Baly
- Penis shorter (Figs 14, 15) (<4.6 times longer than wide), pronotum smooth, apex of pump of spermatheca rounded (Figs 20, 21) 2

- 2 Antenna, tibia, and tarsus yellowish-brown or brown; penis (Fig. 15) 4.3 times longer than wide, sternite VIII long (Fig. 24) .
 *P. diluta* Chûjô
 Antenna, tibia, and tarsus black; penis (Fig. 14) 3.9 times longer than wide, sternite VIII short (Fig. 23) *P. chengi*, **new species**

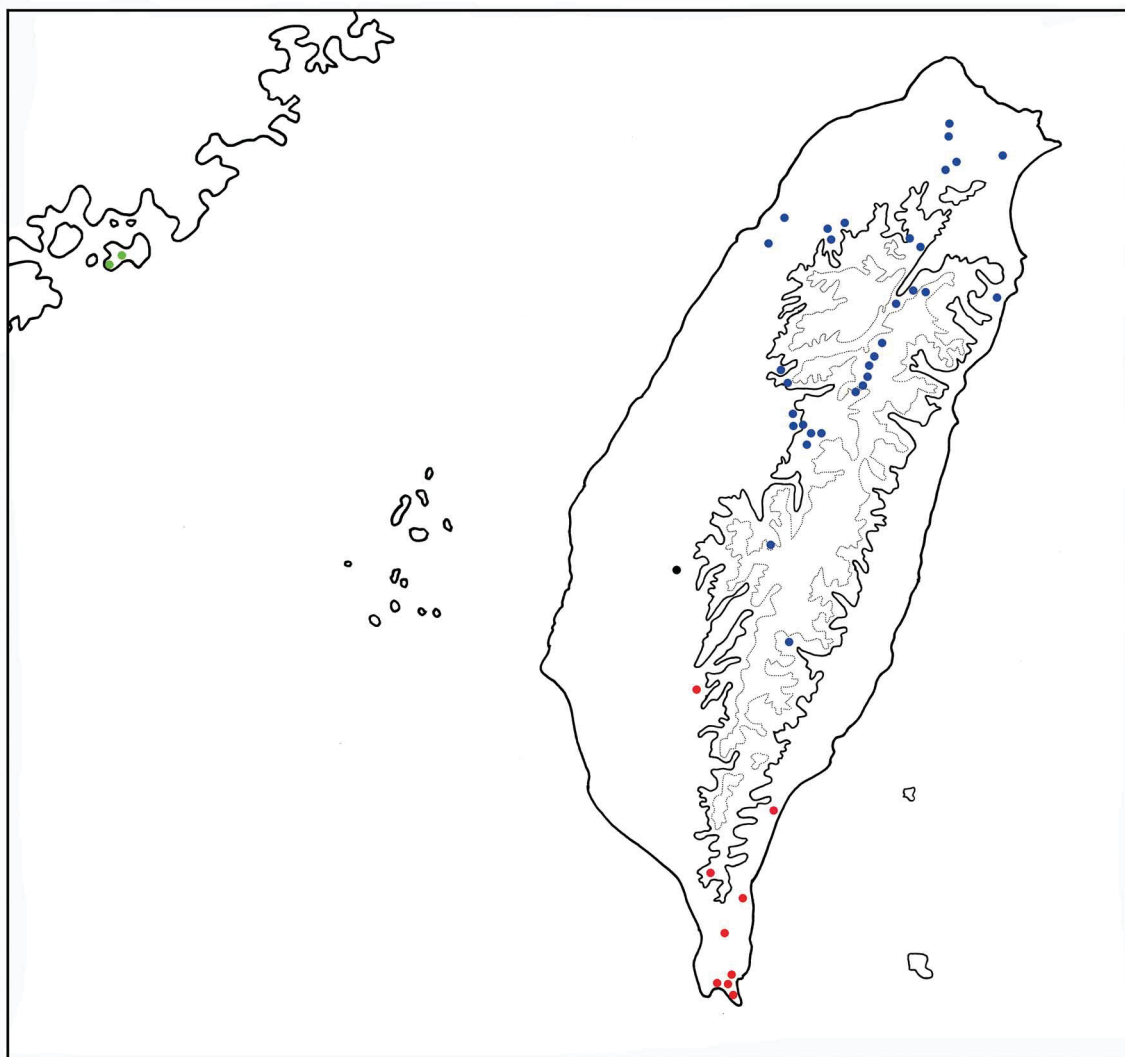


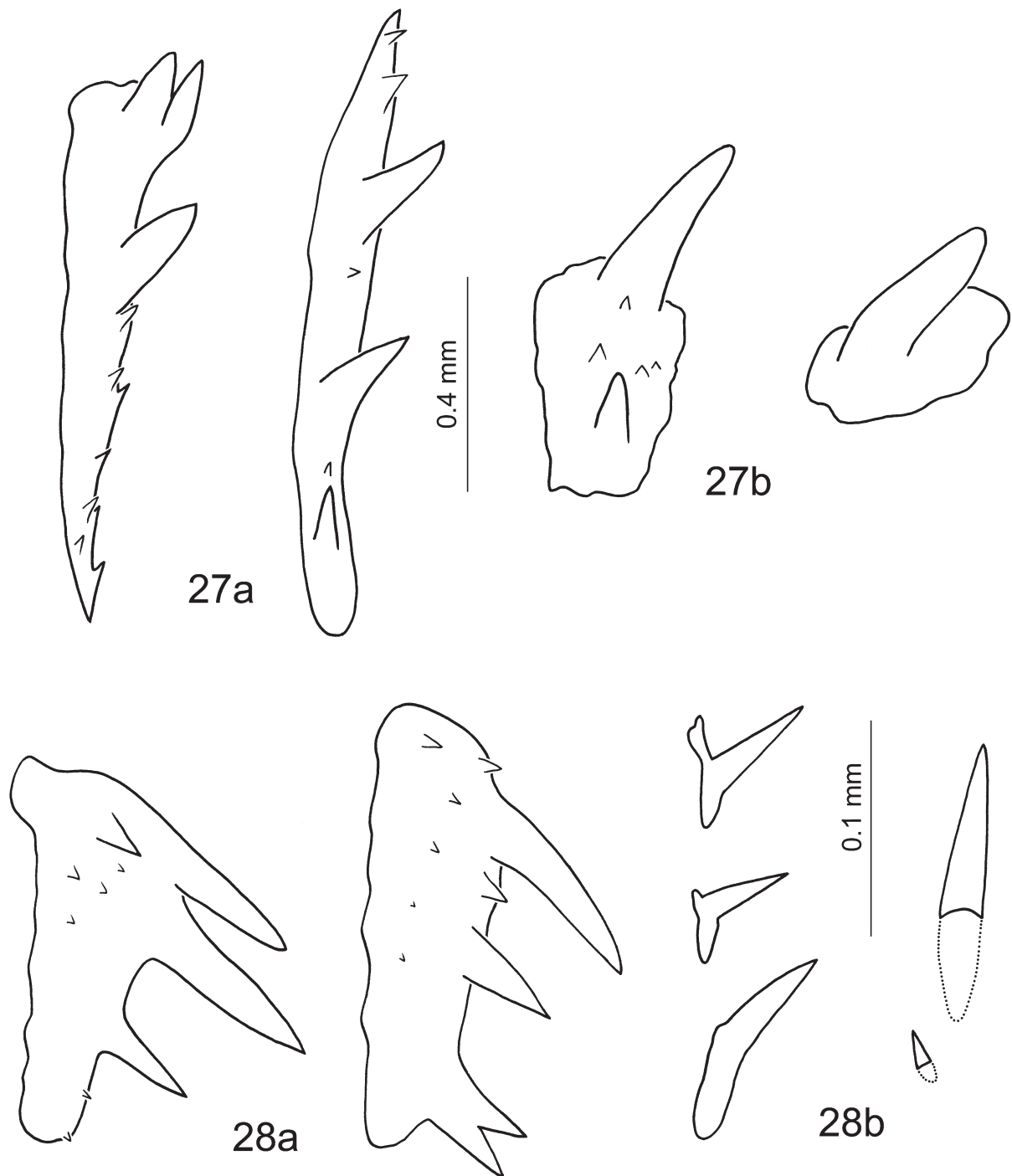
FIGURE 26. Distribution map of *Phygasia* species, solid line: 1000 m, broken line: 2000 m; blue dot: *P. chengi*; red dot: *P. diluta*; black dot: *P. chengi* and *P. diluta*; green dot: *P. ornata*.

Discussion

The genus *Phygasia* in Taiwan, hitherto considered as represented by a single species, *P. ornata*, is a complex of three closely allied species. *Phygasia ornata*, widely distributed in China and the adjacent countries, does not occur in the main island of Taiwan, but is confined to the Kinmen island, close to China. The distributional range of *P. chengi*, is northern Taiwan and that of *P. diluta* is southern Taiwan. However, they are parapatric as their ranges overlap south of Kuantyiling (Tainan county). Color pattern in *P. chengi* and *P. diluta* are highly variable, yet characteristic. However, they can be readily separated by the characters of the genitalia.

Of the 190 species of Alticini recorded from Taiwan, 82 (43%) are endemic (Döberl 2010). The extent of endemism in leaf beetles in Taiwan appears to be underestimated as several endemic species are misidentified and lumped with widely distributed species. The case of the species of *Hoplosomoides* Duvivier in Taiwan is typical. Two out of the three species reported from Taiwan (Beenen 2010) were misidentified as the widely distributed *H. costata* (Baly). The third species, *H. abdominalis* Kimoto, endemic to Taiwan, was found to be a complex of three species (Lee *et al.* 2011). Similarly, *Agetocera taiwana* Chujo, recognized as a single endemic species, was also

shown to be a complex of four parapatric sibling species (Lee et al. 2010). It is likely that more such examples await discovery amongst the Taiwanese chrysomelid fauna.



FIGURES 27–28. Bursa-sclerites of *Phygasia diluta*, a: dorsal bursa-sclerites, b: ventral bursa-sclerites. 27. Collected from Tahanshan; 28. Collected from Kenting.

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FIGURES 29–32. Type specimens of *Phygasia diluta*. 29. Holotype; 30. Labels on the holotype; 31. Allotype; 32. Labels on the allotype.

Literature cited

- Baly, J.S. (1876) Descriptions of new genera and species of Halticinae. *The Transactions of the Entomological Society of London*, 1876, 433–449.
- Beenen, R. (2010) Galerucinae. In: Löbl I. & Smetana A. (Eds), *Catalogue of Palaearctic Coleoptera*, Vol. 6. Apollo Books, Stenstrup, pp. 443–491.
- Döberl, M. (2010) Alticinae. In: Löbl I. & Smetana A. (Eds), *Catalogue of Palaearctic Coleoptera*, Vol. 6. Apollo Books, Stenstrup, pp. 491–563.
- Chen, S.H. (1933a) Some species of Halticinae from Canton. *Peking Natural History Bulletin*, 8, 43–58.
- Chen, S.H. (1933b) Study of Chinese Halticinae beetles with descriptions of some exotic new species. *Sinensia*, 3, 211–254.
- Chu, Y.-I. & Yamanaka, T. (1973) A check list of the present and old names of insect collecting localities in Taiwan. *Annual of Taiwan Museum*, 16, 31–72.
- Chûjô, M. (1936) Studies on the Chrysomelidae in the Japanese Empire (VIII). Subfamily Halticinae (4). *Transactions of the Natural History Society of Formosa*, 26, 15–30.

- Chûjô, M. (1963) Chrysomelid-beetles from Formosa, preserved in the Hungarian Natural History Museum, Budapest. *Annales Historico-Naturales Musei Nationalis Hungarici*, 55, 379–402.
- Ge, D.-Y., Wang, S.-Y. & Yang, X.-K. (2010) A new species of the genus *Phygasia* (Coleoptera: Chrysomelidae: Alticinae) from Taiwan of China. *Biologia*, 65, 325–329.
- Ge, D.-Y., Wang, S.-Y., Li, W.-Z. & Yang, X.-K. (2008) Study of *Phygasia* (Coleoptera: Chrysomelidae) from China, with descriptions of eight new species. *Biologia*, 63, 553–565.
- Gressitt, J. L. & Kimoto, S. (1963) The Chrysomelidae (Coleopt.) of China and Korea, part 2. *Pacific Insects Monograph*, 1B, 301–1026.
- Jacoby, M. (1892) Description of the new genera and species of the phytophagous Coleoptera obtained by Sign. L. Fea in Burma. *Annali del Museo Civico di Storia Naturale di Genova*, 32, 869–999.
- Kimoto, S. (1966) A list of the chrysomelid specimens of Taiwan preserved in the Zoological Museum, Berlin. *Esakia*, 5, 21–38.
- Kimoto, S. (1971) Notes on the Chrysomelidae from Taiwan VI. *Entomological Review of Japan*, 23, 73–87.
- Kimoto, S. (1987) The Chrysomelidae (Insecta: Coleoptera) collected by the Nagoya University Scientific Expedition to Taiwan in 1986. *Kurume University Journal*, 36, 183–194.
- Kimoto, S. (1989) The Taiwanese Chrysomelidae (Insecta: Chrysomelidae) collected by Dr. Kintaro Baba, on the occasion of his entomological survey in 1983 and 1986. *Kurume University Journal*, 38, 237–272.
- Kimoto, S. (1991) The Taiwanese Chrysomelidae (Insecta: Chrysomelidae) collected by Dr. Kintaro Baba, on the occasion of his entomological survey in 1987, 1988 and 1989. *Kurume University Journal*, 40, 1–27.
- Kimoto, S. (2000) Chrysomelidae (Coleoptera) of Thailand, Cambodia, Laos and Vietnam. VII. Alticinae. *Bulletin of the Institute of Comparative Studies of International Cultures and Societies*, 26, 103–299.
- Kimoto, S. & Chu, Y.-I. (1996) Systematic catalog of Chrysomelidae of Taiwan (Insecta: Coleoptera). *Bulletin of the Institute of Comparative Studies of International Cultures and Societies*, 16, 1–152.
- Kimoto, S. & Takizawa, H. (1997) Leaf beetles (Chrysomelidae) of Taiwan. Tokai University Press, Tokyo, 581 pp.
- Lee, C.-F. & Cheng, H.-T. (2007) *The Chrysomelidae of Taiwan 1*. Sishow-Hills, Taipei, 199 pp. (in Chinese)
- Lee, C.-F., Bezděk, J. & Staines, C.L. (2010) A review of the genus *Agetocera* (Coleoptera: Chrysomelidae: Galerucinae) in Taiwan – are there only two species? *Zootaxa*, 2441, 1–19.
- Lee, C.-F., Bezděk, J. & Staines, C.L. (2011) A review of the genus *Haplosomoides* Duvivier, 1890 in Taiwan and Japan (Coleoptera: Chrysomelidae: Galerucinae). *Zoological Studies*, 50, 118–138.
- Maulik, S. (1926) *The fauna of British India, including Ceylon and Burma. Coleoptera. Chrysomelidae (Chrysomelinae and Halticinae)*. Taylor & Francis, London, 442 pp.
- Medvedev, L. (2007) New species of *Phygasia* Dejean 1837 from Indochina (Coleoptera: Chrysomelidae: Alticinae). *Genus*, 18, 631–636.
- Mohamedsaid, M.S. (1998) Rekod baru kumbang Alticinae dari Semenanjung Malaysia (Coleoptera: Chrysomelidae). *Serangga*, 3, 93–101.
- Scherer, G. (1969) Die Alticinae des indischen Subkontinentes (Coleoptera – Chrysomelidae). *Pacific Insects Monograph*, 22, 1–251.
- Shih, H.-T., Ho, C.-C. & Wu, W.-J. (2002) Chrysomelidae (Insecta: Coleoptera) from Kinmen. *Journal of the Agricultural Research of China*, 51, 45–55. (in Chinese)
- Wang, S.-Y. (1995) Coleoptera: Chrysomelidae – Alticinae. In: Wu H. (Ed.), *Insects of Baishanzu Mountain, Eastern China*. China Forestry Publishing House, Beijing, pp. 264–266. (in Chinese)
- Yu, P.-Y., Wang, S.-Y. & Yang, X.-K. (1996) *Economic Insect Fauna of China, Fasc. 54. Coleoptera: Chrysomelidae (II)*. Science Press, Beijing, 324 pp. (in Chinese)